

m.; St. Vincent, Minn., 25th, 8 to 10.30 p. m.; Olivet, Dak., 24th, 10 p. m.; Fort Stevenson, Dak., 6 to 8 p. m.; Fort Sully, Dak., 25th, about 9 p. m.; Fort Assinnaboine, Mont., 24th, 6 p. m. to morning of the 25th; Helena, Mont., 24th, 8 p. m. The following were local displays: Eastport, 11th, 11 p. m. to midnight; Harvard College, Cambridge, Mass., 5th, 10 to 11 p. m.; New Corydon, Ind., 7th, visible for a short time after sunset; Ft. Wayne, Ind., 20th, 9 p. m.; Port Huron, 4th, 9 to 10.12 p. m.; Clear Creek, Neb., 17th, 8 p. m.; Duluth, 14th, 8 to 10.40 p. m.; St. Vincent, 12th, 7 p. m. to midnight; Fort Stevenson, Dak., 11th 10.30 p. m. to morning of 12th; Fort Assinnaboine, Mont., 11th, 7 to 10.30 p. m.; 12th, 6 to 9.30 p. m.; Northfield, Minn., 14th, 9 p. m.

Thunder-storms.—They were reported in the various States and Territories as follows: Alabama, on the 13th, 14th, 28th; Arizona, 17th; Arkansas, 13th; Florida, 5th, 13th, 14th, 20th, 28th, 29th; Georgia, 4th, 29th; Illinois, 12th, 13th, 28th; Indiana, 1st, 12th, 13th, 14th, 19th; Indian Territory, 12th, 13th; Iowa, 1st, 7th, 12th, 13th, 20th, 27th; Kansas, 10th, 12th, 18th; Kentucky, 14th; Louisiana, 13th, 14th, 20th, 28th; Michigan, 12th, 20th; Mississippi, 3rd, 13th, 14th, 28th; Missouri, 2nd, 10th, 12th, 13th, 19th to 22nd; North Carolina, 29th, 30th; Tennessee, 13th, 28th; Texas, 13th, 19th; Virginia, 22nd, 29th.

Zodiacal Light.—St. Vincent, Minn., 13th; Springfield, Ill., 15th; Nashville, Tenn., 15th to 18th; Kittyhawk, N. C., 17th; New Corydon, Ind., 8th, 9th, 10th, 15th to 19th, 23rd, 24th, 25th, 28th; Monticello, Ia., 31st; Cambridge, Mass., 8th, 10th, 11th, 15th, 16th, 18th, 19th, 21st; Somerset, Mass., 9th, 10th, 15th to 21st; Northport, Mich., 8th, 23rd; Clear Creek, Neb., 14th, 16th, 22d, 23d; Atco, N. J., 17th; Dyberry, Pa., 24th; Wytheville, Va., 17th.

Telegraphic Communication Interfered with by Atmospheric Electricity.—Brackettville, Texas, 19th.

OPTICAL PHENOMENA.

Lunar halos have been observed in the various districts on the following dates: New England, 1st to 4th, 6th, 8th, 9th, 11th, 13th, 31st; Middle Atlantic States, 1st to 6th, 8th, 9th, 10th, 25th, 26th, 28th, 29th, 31st; South Atlantic States, 1st, 3rd, 4th, 6th, 7th, 24th, 26th, 28th, 31st; Florida Peninsula, 3rd, 7th, 28th; East Gulf States, 1st, 6th, 24th, 31st; West Gulf States, 2nd to 6th, 8th, 9th, 13th, 26th, 31st; Rio Grande Valley, 26th, 29th; Ohio Valley and Tennessee, 1st, 2nd, 5th to 10th, 12th, 14th, 16th, 24th, 28th to 31st; Lower Lake Region, 1st, 2nd, 5th, 8th, 9th, 11th, 20th, 24th, 25th, 29th, 30th; Upper Lake Region, 1st, 2nd, 7th to 9th, 16th, 26th to 30th; Extreme Northwest, 3rd, 10th, 24th, 27th, 28th, 31st; Upper Mississippi Valley, 1st, 2nd, 4th, 7th, 8th, 10th, 16th, 17th, 24th to 31st; Missouri Valley, 1st, 5th, 7th, 19th, 25th to 29th; Northern Slope, 1st, 3rd to 5th, 8th, 9th, 11th, 25th, 26th, 29th, 30th, 31st; Middle Slope, 1st, 2nd, 5th, 10th, 26th, 30th; Southern Slope, 2nd, 3rd, 5th, 6th, 7th, 9th, 12th, 13th, 16th, 17th, 24th, 25th, 26th, 30th; Southern Plateau, 1st, 4th to 7th, 10th, 25th, 26th, 27th, 31st; Middle Plateau, 4th, 7th, 8th, 15th, 20th, 26th, 28th, 31st; Northern Plateau, 3rd, 8th, 10th, 27th to 30th; North Pacific Coast Region, 30th; Middle Pacific Coast Region, 3rd, 21st, 25th, 28th to 31st; South Pacific Coast Region, 1st to 5th, 10th, 27th, 29th, 30th, 31st.

Solar halos have been observed in the various districts on the following dates: New England, 2d, 6th, 9th, 10th, 12th, 20th, 21st; Middle Atlantic States, 2d, 3d, 8th, 11th, 12th, 14th, 19th, 20th, 21st; South Atlantic States, 1st, 2d, 20th, 25th, 26th, 31st; Florida Peninsula, 21st, 24th, 25th; East Gulf States, 24th, 29th; Ohio Valley and Tennessee, 5th, 8th, 9th, 10th, 12th, 16th to 20th, 21st, 28th, 29th, 30th; Lower Lake Region, 2d, 11th, 20th, 29th; Upper Lake Region, 16th, 19th, 27th; Extreme Northwest, 10th, 18th; Upper Mississippi Valley, 1st, 3d, 7th, 8th, 10th, 16th to 19th, 24th to 27th, 29th to 31st; Missouri Valley, 9th, 25th, 26th; Northern Slope, 7th, 26th, 28th, 29th; Middle Slope, 1st, 13th, 17th, 26th, 28th, 30th, 31st; Southern Slope, 13th, 22d; Southern Plateau, 2d, 11th, 25th, 31st; Middle Plateau, 14th, 29th, 31st; Northern Plateau, 8th, 14th, 22d, 28th; Middle Pacific Coast Region, 5th, 8th, 14th, 20th, 21st, 24th, 25th, 28th, 31st; South Pacific Coast Region, 3rd, 4th, 5th, 10th, 21st.

Mirage.—Indianola, 1st, 5th, 16th, 20th to 23d, 26th, 30th; Northport, Mich., 15th, 23d, 26th; Genoa, Neb., 13th, portions of the city of Columbus, 19 miles distant, were distinctly visible.

MISCELLANEOUS PHENOMENA.

Earthquakes.—Eureka, Nev., Dec. 7th, very heavy shock. Kingston, Jamaica, Dec. 26th, 11.45 p. m., slight shock, lasting less than one second. Hawaii, Sandwich Islands, Sept. 30th, 5 a. m., "the most terrible shocks experienced in the past 40 years. The first shock came suddenly with a quick, jerking, terrific crash, as if the foundations of everything about were shivered to pieces; this shock lasted about two minutes with an interval of nearly three minutes, when there followed a second shock similar to the first but not quite equal in terrific violence. Some light tremblings were felt during the remainder of the day and three moderate shocks on the following day. Light shocks continued at intervals to October 3rd inclusive. During this period of earthquake disturbance, from September 30th to October 4th, many buildings were terribly shattered; stone houses were subjected to the greatest injury; many miles of stone wall fencing were

destroyed and most of the cisterns in the city shattered and deprived of water. Everything moveable in the houses, such as crockery, glassware and furniture, even where the building was not particularly damaged, was jumbled and thrown together in confusion. Many buildings had from 20 to 30 cracks in the walls, while the great shock of 1868 did not disturb the walls at all."

Meteors.—Boise City, 9th, 18th; Umatilla, 8th; Yuma, Ariz., 7th; Helena, Mont., 11th, 9.30 p. m., started from a point a little southwest of the zenith, and moved in a southwesterly direction, traversing an arc of 30°; exploded with a loud report and burst into fragments. During its flight, which lasted 5 seconds, the surrounding country was brilliantly illuminated. Davenport, Ia., 6th, Madison, Wis., 10th; Little Rock, 17th; Wood's Holl, Mass., 1st; Morrison, Ill., 16th; Charleston, Ill., 23d; New Corydon, Ind., 10th, 14th, 15th; Yates Centre, Kan., 8th; Dexter, Me., 11th; Rowe, Mass., 25th; Springfield Mass., 10th; Fayette, Miss., 18th, 28th, 30th; Freehold, N. J., 11th; Palermo, N. Y., 17th; Jacksonburg, O., 24th; Fallsington, Pa., 10th.

Migration of Birds.—*Geese flying southward:* Red Bluff, Cal., 5th, 11th; Dexter, Me., 8th; Somerset, Mass., 12th, 15th, 16th, 18th, 20th; Fall River, Mass., 20th; Austin, Tenn., 9th, 30th; Strafford, Vt., 21st. *Flying northward:* Indianola, 16th; Fort Madison, Ia., 2d; Strafford, Vt., 22d. *Flying northeastward:* Visalia, Cal., 1st; Indianola, 26th. *Flying southeastward:* Davenport, Ia., 22d. *Flying southwestward:* Indianola, 22d. *Ducks flying southward:* Clear Creek, Neb., 9th. *Flying westward:* Yates Centre, Kan., 12th. *Flying eastward:* Graham, Tex., 7th.

Polar Bands.—Prescott, Ariz., 1st, 2d, 21st; Nashville, Tenn., 30th; Augusta, Ga., 10th; New Corydon, Ind., 16th, 17th, 18th, 25th, 29th. Guttenburg, Ia., 1st; Dana, Ia., 1st, 12th; Yates Centre, Kan., 1st, 5th, 6th, 10th, 31st; Gardiner, Me., 2d, 9th; Clear Creek, Neb., 1st, 4th, 5th, 6th, 17th, 18th, 19th, 21st, 26th, 27th, 30th; Freehold, N. J., 9th, 18th; Vineland, N. J., 2d, 9th, 10th.

Prairie and Forest Fires.—Bismarck, D. T., 16th, 17th, 18th; Fort Supply, Ind. T., 8th, 9th, 12th, 14th to 16th; Fort Gibson, Ind. T., 9th, 11th, 22nd; Fort Stevenson, D. T., 5th, 12th, 17th, 23d to 26th; Yankton, 8th, 9th, 18th, 19th, 24th to 28th; Fort Totten, D. T., 22d, 25th, 26th, 27th.

Sand Storms.—San Carlos, Ariz., 14th, 15th; Camp Thomas, Ariz., 10th, 12th, 14th, 15th, 29th; Ft. Garland, Col., 28th.

Sunsets.—The characteristics of the sky as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from 184 stations show 5,654 observations to have been made of which 32 were reported doubtful; of the remainder, 5,622, or 86.5 per cent., were followed by the expected weather.

Sun Spots.—The following record of observations has been forwarded by Mr. D. P. Todd, Director of the Lawrence Observatory, Amherst, Mass.:

DATE— Dec., 1881.	No. of new—		Disappeared by solar rotation.		Reappeared by solar rotation.		Total number visible.		REMARKS.
	Groups	Spots.	Groups	Spots.	Groups	Spots.	Groups	Spots.	
2, 10 a. m.....	2	20†			0	0	3	30†	Many of the spots small.
5, 2 p. m.....	1	15			0	0	3	33†	
8, 11 p. m.....	1	2			1	2	3	23†	
9, 11 a. m.....	2	7	0	5	1	2	5	30†	
10, 11 a. m.....	2	8	1	3	1	2	6	33†	
11, 9 a. m.....	0	0	0	5	0	0	6	30†	
16, 12 m.....							6	25†	
17, 10 a. m.....	0	0	0	5	0	0	6	20†	
18, 2 p. m.....	0	0	1	2	0	0	4	17	
9, 12 m.....	0	0	1	5	0	0	3	12	
24, 3 p. m.....							1	12	Broad areas of faculae.
25, 12 m.....	0	0	0	3	0	0	1	9	
27, 2 p. m.....	2	7	0	6	0	0	3	10	
28, 2 p. m.....	1	4	1	2	1	2	3	12	
30, 4 p. m.....	0	0	0	0	0	0	3	12	
31, 4 p. m.....	0	0	0	0	0	3	3	15	

† Approximated.

Faculae were seen at the time of every observation.

Mr. H. D. Gowey, at North Lewisburg, Ohio, reports: Sun spots observed on every clear day during the month. They were largest on the 5th, 17th; smallest, on the 10th; most numerous on the 15th, and least numerous on the 23d.

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W. B. HAZEN,

Brig. & Bvt. Maj. Gen'l,
Chief Signal Officer, U. S. A.

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